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ABSTRACT

This study of the patterns of communication in the field of instructional technology examined the reference lists provided with each article or review in three journals for a period of five years to determine: (1) who the most cited authors in the field are; (2) whether invisible colleges exist in the field; and (3) if invisible colleges do exist, who the participants are in each invisible college. The journals studied were the Journal of Instructional Development (JID, Spring 1985-Fall 1990); Educational Communication and Technology Journal (ECTJ, Spring 1985-Summer 1990); and Performance Improvement Quarterly (PIQ, Spring 1988-Fall 1990). The name of each author, co-author, or editor of works cited was entered in a database together with the name of the journal, date of citation, and volume and issue numbers of the journal. The number of citations per author was recorded, and individuals were included in the study if they had been cited a minimum of five times. From the 12,220 citations entered in the database for all three journals, 386 individuals were selected. The highest numbers of citations reported were 83 (R. M.Gagne), 76 (R. D. Tennyson), and 43 (R. Kaufman). The results of a hierarchical cluster analysis among frequently cited individuals identified 53 homogeneous groups. For many of the groups dominant individuals could also be identified. The results of the study support the conclusion that there are "many" invisible colleges in the field, and that the groups of frequently cited individuals do significantly influence the development of the field and the practice of industrial design. (7 tables, 13 references) (BBM)

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Citation Networks of Selected Instructional Design and Technology Journals, 1985 - 1990

Authors:

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Citation Networks of Selected Instructional Design and Technology Journals, 1985-1990

The field of instructional design and technology is certainly at a stage of development where it's history, current status, and future deserve attention by researchers in the field. So (1988) suggests that "Self-reflection is a mark of maturity" (So, 1988; p. 236). One approach used for exploring the patterns of communication in a discipline is bibliometric research. It is assumed results from such research will provide one indicator of the structure of the knowledge base in a field, as well as the disciplinary boundaries (e.g., invisible colleges within a discipline, Crane, 1972). Garfield (1979) has pointed out potential problems with citation studies, including the lack of quality indicators of the particular scholarly work, intentions for citing authors is not made clear, potential bias for recent publications, and the fact that all citations in many studies are weighted equally. After reviewing studies which have addressed some of Garfield's concerns, So (1988), concludes that "it seems fair to conclude that citation analysis is a useful method if it is employed carefully" (p. 237).

Several investigators have attempted to reflect on the nature and structure of the field of instructional design and technology (Braden, 1981; Dick, & Dick, 1989; Durzo, Diamond, & Doughty, 1979; Gentry & Csete, 1991; Reigelith, 1989; Sachs, 1984; Heinich (1984); Wedman, 1987; Winn,

1989). A majority of these papers are theoretical or conceptual in nature while two are bibliographic studies.

The primary purpose of this paper is to update and extend the study conducted by Sachs (1984). Using citations from two journals, Journal of Instructional Development (JID), (Spring, 1980 - Winter, 1983) and Performance and Instruction Journal (P&I), (June, 1980 - May, 1983), the study by Sachs (1984) addressed questions concerning patterns of citation, frequency of cited authors, identification of invisible colleges, and systematic literature development. Sachs concluded that there are invisible colleges within the field of instructional development, as a whole there is poor linkage in the field, and that across the two journals included, the groups identified and the linkages are different. Sachs concluded that "based on the findings from this study, the literature in JID and P&I are reporting more of the art and less of the science of instructional development." (p. 13).

The current study will address the following three questions:

1. Who are the most cited authors in the field?

2. Do invisible colleges exist in the field of instructional design and technology?

3. If invisible college exist in the field, who are the participants in each invisible colleg

Method

Data Source

The present study will include the Journal Instructional Development (JID, Spring 1985 - Fall 1990), Educational Communication and Technology Journal (ECTJ, Spring 1985 - Summer 1990), and Performance Improvement Quarterly (PIQ, Spring 1988 - Fall 1990). It should be noted that JID and ECTJ are now printed under one cover (Educational Technology Research and Development (ETRD)). However, the identity of each journal (JID and ECTJ) is preserved including separate editors and editorial boards. We selected PIQ, a relatively new journal rather that P&I since in our judgement PIQ includes more theoretical papers and research studies. Both journals are published by the same national organization.

We have also extended the data set by increasing the number of years for journal inclusion to five.

Procedure

For Each of the three journals included in the study (ECTD, JID, PIQ) reference lists included in each article or review were collected. The name of each author, co-author or editor was entered in a data base. Information entered for each author included name, date of citation, volume and issue number of the journal. An alphabetical sort was then performed by author. Using the sorted data base listing, the number of citations per author was recorded.

Individuals were included in the study if they were cited a

minimum of 5 times (after Sachs, 1984). A matrix was then constructed which identified the number of citations for each article by author. This matrix was required for the subsequent analysis.

Results and Discussion

Descriptive Information

The total number of authors cited in all reference lists collected as well as the number of authors included in the study for each journal is reported in Table 1. The total number of citations for frequently cited authors by journal are listed in Tables 2, 3, and 4.

Insert Tables 1,2, 3, and 4

From the 12,220 citations entered in the data base for all three journals, a total of 386 individuals were selected, 33 from PIQ, 131 from JID, and 222 from ECTJ (See Table 1.). As indicated in Table 1, an individual was included if they received 5 or more citations for the journal under consideration.

The highest numbers of citations reported were 83 (R. M. Gagne), 76 (R. D. Tennyson), and 43 (R. Kaufman) for JID, ECTJ, and PIQ, respectively.

Hierarchical Cluster Analysis

The purpose of the hierarchical cluster analysis was to determine if the data could be arranged into homogeneous groups. The data was analyzed using the Johnson (1967)

maximum (compactness) method. Results of the cluster analysis are reported in Tables 5, 6, and 7.

Insert Tables 5, 6, and 7

The clusters identified among frequently cited individuals suggest that homogeneous groups do exist. There were 21, 25, and 7 homogeneous groups identified for ECTJ/ETRD(Research), JID/ETRD(Development), and PIQ respectively. It should be noted that PIQ is a relatively new journal and the number of data points included is much smaller than for the other journals included.

The cluster analysis yielded 5 clusters with 8 or more frequently cited individuals for JID. For JID, 16 groups of highly cited individuals are relatively small. There were 9 relatively large clusters identified for ECTJ. (Clusters 1.0 - 9.0 inclusive). The number of authors in each of the 9 large clusters ranged from 10 to 32. With the exception of cluster 1.0, the analysis for PIQ yielded seven small homogeneous groups of individuals. This was expected since the journal began publishing in 1988.

For many of the groups dominant individuals (highly cited) can be identified. For example, R. M. Gagne was cited 83 times in JID (See Table 5, cluster 1.0). The the results of the study support the conclusion that there are

"many" invisible colleges in the field. This may be the case since the field is quite diverse. It is also a possible indication that the field is highly fragmented and not clearly defined. However, the groups of frequently cited individuals do significantly influence the development of the field and the practice of instructional design and development.

References

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Wedman, J. F. (1987). Citation patterns in the computer-based instruction literature. Journal of Computer-Based Instruction, 14(3), 91-95.

Winn, W. (1989). Toward a rationale and theoretical basis for educational technology. Educational Technology Research and Development, 37, 35-46.

Table 1.0
Total Citations Identified in Selected Instructional Journals

Journal	Volumes Used in Study	Total Citations	Citations Included*
PIQ	Spring 1988 - Fall 1990	1805	33
JID/ETRD (Development Section)	Spring 1985 - Fall 1990	3978	131
ECTJ/ETRD (Research Section)	Spring 1985 - Summer 1990	6437	222
	Totals	12,220	

* Individuals with five or more citations included in the study.

TABLE 2.0

Number of Citations for Frequently Cited Authors

JID/ETRD (Development Section)

Author	Citations	Author	Citations	Author	Citations
Gagne, R.M.	83	Feightner, J.W.	8	Wildman, T.M.	6
Reigeluth, C.M.	79	Hannum, W.H.	8	Wittrock, M.C.	6
Briggs, L.J.	49	Morgan, R.M.	8	Alesandrin, K.L.	5
Jonassen, D.H.	42	O'Neil, H.F. Jr.	8	Alessi, S.M.	5
Hannafin, M.J.	32	Readence, J.E.	8	Bandura, A.	5
Merrill, M.D.	26	Romiszowski, A.J.	8	Bean, T.W.	5
Keller, J.M	26	Sleeman, D.H.	8	Becker, H.J.	5
Dick, W.	25	Driscoll, M.P.	7	Berman, P.	5
Tennyson, R.D.	23	Grooper, G.L.	7	Bork, A.	5
Bratton, B.	20	Hooper, K.	7	Boyer, E.L.	5
Reiser, R.A.	19	Hooper, S.	7	Burkman, E.	5
Clark, R.E.	18	Kincaid, J.P.	7	Christensen, D.L.	5
Glaser, R.	17	McCombs B.L.	7	Dalton, D.W.	5
Kaufman, R.A.	17	Morrison, G.R.	7	Davis, R.H.	5
Kearsley, G.P.	17	Novak, J.D.	7	Daynes, R.	5
Norman, G.R.	16	Rossett, A.	7	Deden-Parker, A.	-
Sullivan, H.J.	16	Salomon, G.	7	Ericsson, K.A.	5
Anderson, J.R.	15	Schiffman, S.	7	Flavell,, J.H	5
Branson, R.K.	15	Sprio, R.J.	7	Frase, L.T.	5
Rieber, L.	15	Wilson, R.G.	7	Gagne, E.	5
Brown, J.S.	14	Alen, V.L.	6	Gilbert, T.F.	5
Ross, S.M.	14	Allen, B.S.	6	Heyneman, S.	5
Goodson, L.A.	13	Barrows, H.S.	6	Hunter, M.	5
Andrews, D.H.	12	Bunderson, C.V.	6	Kinzie, M.B.	5
Carey, L.	12	Dansereau, D.E.	6	Lesgold, A.M.	5
Simon, H.A.	12	Davies, I.K.	6	Malon, T.W.	5
Wager, W.W.	12	DeBloois, M.L.	6	Markle, S.M.	5
Brown, A.L.	11	Foshay, W.R.	6	Martin, B.L.	5
Anderson, R.C.	10	Harmon, P.	6	Masia, B.B.	5
Bower, G.H.	10	Heinich, R.	6	Mayer, R.E.	5
Higgins, N.	10	Joyce, B.	6	Naisbitt, J.	5
Park, O.	10	Knirk, F.G.	6	Neufeld, V.R.	5
Snow, S.E.	10	Kulik, F.G.	6	Phillips, T.L.	5
Barby, B.	9	Levie, W.H.	6	Resnick, L.B.	5
Collins, A.M.	9	Levin, J.R.	6	Richards, B.F.	5
Craik, F.I.M.	9	Mager, R.F.	6	Rogers, E.M.	5
Gustafson, K.L.	9	McLaughlin, M.W.	6	Rumelhart, D.E.	5
Merrill, P.F.	9	Montague, W.E.	6	Scandura, J.M.	5
Misanchuk, E.R.	9	Norman, D.A.	6	Seidel, R.J.	5
Salisbury, D.F.	9	Pressley, M.	6	Shrock, S.A.	5
Shneiderman, B.	9	Trollip, S.R.	6	Silber, K.H.	5
Tessmer, M.A.	9	Tulving , E.	6	Snelbecker, G.E.	5
Ambron, S.R.	8	Walberg, H.J.	6	Stein, F.S.	5
Bloom, B.S.	8	Weinstein, C.E.	6		

TABLE 3.0
Number of Citations for Frequently Cited Authors
ECTJ/ETRD (Reasearch Section)

Author	Citations	Author	Citations	Author	Citations
Tennyson, R.D.	76	Piaget, J.	13	Lesgold, A.M.	9
Levin, J.R.	72	Wright, J.C.	13	Mastropieri, M.A.	9
Reigeluth, C.M.	62	Greeno, J.G.	12	Paivio, A.	9
Ross, S.M.	59	Jonassen, D.H.	12	Papert, S.	9
Clark, R.E.	59	Levie, W.H.	12	Scruggs, T.E.	9
Salomon, G.	54	O'Dell, J.K.	12	Wager, W.W.	9
Hannafin, M.J.	48	Reiser, R.A.	12	Wang, M.C.	9
Gagne, R.M.	48	Schramm, W.L.	12	Wartella, E.	9
Presley, M.	44	Slavin, R.E.	12	Watkins, B.A.	9
Kulik, J.A.	33	Bower, G.H.	11	Bandura, A.	8
Merrill, M.D.	32	Brown, A.L.	11	Belmont, J.M.	8
Mayer, R.E.	30	Davidson, G.V.	11	Bryant, J.	8
Snow, R.E.	28	Holyoak, K.J.	11	Burton, R.R.	8
Anderson, J.R.	28	McCormick, C.B.	11	Campbell, D.T.	8
Anderson, D.R.	28	Miller, G.E.	11	Fleming, M.L.	8
Glaser, R.	27	Rothen, W.	11	Huston, A.C.	8
Brown, J.S.	22	Webb, N.M.	11	Keller, F.S.	8
Carrier, C.A.	21	Williams, G.W.	11	Landa, L.N.	8
Morrison, G.R.	21	Atkinson, R.C.	10	Lincoln, Y.S.	8
Simon, H.A.	21	Bork, A.	10	Meurrens, M.	8
Heinich, R.	20	Branson, R.K.	10	O'Neil, H.F.	8
Briggs, L.J.	19	Christensen, D.L.	10	Palmer, E.L.	8
Sulivan, H.J.	19	Cohen, P.A.	10	Pellegrino, J.W.	8
Anderson, R.C.	17	Dick, W.	10	Resnick, L.B.	8
McCombs, B.L.	17	Gardner, H.	10	Romiszowski, A.	8
Butterfield, E.C.	16	Montague, W.E.	10	Simonson, M.R.	8
Rakow, E.A.	16	Peterson, P.L.	10	Stevens, A.L.	8
Williams, M.D.	16	Pettersson, R.	10	Winn, W.D.	8
Bransford, J.D.	15	Phillips, T.L.	10	Ball, S.A.	7
Chadwick, C.B.	15	Reder, L.M.	10	Bogatz, G.A.	7
Collins, A.M.	15	Suppes, P.	10	Carey, L.	7
Guba, E.G.	15	Anand, P.G.	9	Case, R.P.	7
Sleeman, D.H.	15	Ausubel, D.P.	9	Cook, T.D.	7
Wittrock, M.C.	15	Bloom, B.S.	9	Craik, F.I.M.	7
Ershov, A.P.	14	Bruner, J.S.	9	DeBloois, M.L.	7
Hartley, J.	14	Chipman, S.F.	9	Deci, E.L.	7
Lepper, M.R.	14	Collins, W.A.	9	Eisner, E.W.	7
Levin, S.R.	14	Cormier, S.M.	9	Flavell, J.H.	7
Lorch, E.P.	14	Cronbach, L.J.	9	Johnson, D.W.	7
Park, O.	14	Dalton, D.W.	9	Maehr, M.L.	7
Steinberg, R.J.	14	Garhart, C.	9	Malone, T.W.	7
Bangert, R.L.	13	Hagman, J.D.	9	McGivern, J.E.	7
Kulik, C.C.	13	Kerr, S.T.	9	Mielke, K.W.	7
Norman, D.A.	13	Kinzie, M.B.	9	Mosley, M.L.	7

TABLE 3.0 (Continued)
Number of Citations for Frequently Cited Authors
ETCJ/ETRD (Research Section)

Author	Citations	Author	Citations	Author	Citations
Newell, A.	7	Morles, A.	6	Krisak, N.	5
O'Shea, T.	7	Petkovich, M.D.	6	Liben, L.	5
Park, S.I.	7	Roberts, T.	6	Lockhart, K.A.	5
Reese, H.W.	7	Schon, D.A.	6	Markle, S.M.	5
Reif, F.	7	Sherman, J.G.	6	McDaniel, M.A.	5
Seidel, R.J.	7	Shulman, L.S.	6	Megarry, J.	5
Spiro, R.J.	7	Siegler, R.S.	6	Morgan, R.M.	5
Steinberg, E.R.	7	Stanley, J.C.	6	Nelson, T.O.	5
Streibel, M.J.	7	Windham, D.M.	6	Nunan, T.	5
Taylor, R.	7	Alwitt, L.F.	5	Pea, R.D.	5
Allessi, S.M.	6	Andrews, D.H.	5	Pezdek, K.	5
Bereiter, C.	6	Bangert-Downs, R.	5	Pittman, T.S.	5
Calvert, S.L.	6	Bryant, S.L.	5	Reed, S.K.	5
Carroll, J.M.	6	Bunderson, C.V.	5	Reeves, B.	5
Chi, M.T.H.	6	Buttrey, T.	5	Reiber, L.P.	5
Delaney, H.D.	6	Campione, J.C.	5	Rumelhart, D.E.	5
DiVesta, F.J.	6	Chen, M.	5	Scanlon, E.	5
Federico, P.A.	6	Dunn, T.G.	5	Schmid, R.F.	5
Fennema, E.	6	Dwyer, F.M.	5	Segal, J.W.	5
Franks, J.J.	6	Gage, N.L.	5	Sharan, S.	5
Gay, G.	6	Gentner, D.	5	Shriberg, L.K.	5
Gerlach, V.S.	6	Ghatala, E.S.	5	Stein, B.S.	5
Gibson, J.J.	6	Gick, M.L.	5	Thorndike, E.L.	5
Glass, G.V.	6	Goodson, L.A.	5	Tobias, S.	5
Jamison, D.	6	Greene, M.	5	Trollip, S.R.	5
Johnson, R.T.	6	Grooper, G.L.	5	Tulis, T.S.	5
Keller, J.M.	6	Guilford, J.P.	5	Waller, R.	5
Lentz, R.	6	Houghton, H.A.	5	Weil, M.	5
McCormick, D.B.	6	Johnson, C.W.	5	Willows, D.M.	5
Morgan, G.	6	Joyce, B.	5	Wilson, D.M.	5

TABLE 4.0
Number of Citations for Frequently Cited Authors
PIQ

Author	Citations	Author	Citations	Author	Citations
Kaufman, R.	43	Jay, S.J.	9	Langley, P.C.	6
Gagne, R.M.	18	Zemke, R.	9	Miller, P.L.	6
Rothwell, W.	16	Bloom, B.S.	7	Ambron, S.	5
Jonassen, D.H.	16	Gilbert, T.F.	7	Binder, C.V.	5
Gerlach, V.S.	15	Harless, J.	7	Campbell, D.T.	5
Glaser, R.	14	Hooper, K.	7	Clark, R.E.	5
Reigeluth, C.M.	13	Kirkpatrick, D.A.	7	Hartley, J.	5
Simon, H.A.	12	Patton, M.Q.	7	Knowles, M.S.	5
Smith, M.E.	11	Schmid R.F.	7	Landa, L.N.	5
Swanson, R.A.	10	Sobel, I.	7	Mager, R.F.	5
Anderson, J.G.	9	Wright, P.C.	7	Merrill, M.D.	5

TABLE 5.0
Hierarchical Clusters Suggesting Jointly Occupied Positions in the Network of Highly Cited Authors, JID/ETRD (Development Section)

Author	Citations	Author	Citations	Author	Citations
1.0		**4.0**		**9.0**	
Craik, F.I.M.	9	Bork, A.	5	Burkman, E.	5
Flavel, J.H.	5	Levie, W.H.	6	Martin, B.L.	5
Scandura, J.M.	5	Allen, B.S.	6	Schiffman, S.	7
Montague, W.E.	6	Hooper, S.	7	Shrock, S.A.	5
Norman, D.A.	6	Morrison, G.R.	7	Tessmer, M.A.	9
Rumelhart, D.E.	5	Hannafin, M.J.	32	Wager, W.W.	12
Novak, J.D.	7	Ross, S.M.	14		
Stein, F.S.	5	Salisbury, D.F.	9	**10.0**	
Keller, J.M.	26			Ambron, S.R.	8
Merrill, M.D.	26	**5.0**		Hooper, K.	7
Tennyson, R.D.	23	Davis, R.H.	5	Malone, T.W.	5
Clark, R.E.	18	Anderson, J.R.	15	Shneiderman, B.	9
Glaser, R.	17	Collins, A.M.	9	Snow, R.E.	10
Jonassen, D.H.	42	Levin, J.R.	6		
Gagne, R.M.	83	Pressley, M.	6	11.0	
Briggs, L.J.	49	Seidel, R.J.	5	Kinzie, M.B.	5
Reigeluth, C.M.	79	Brown, J.S.	14	Davies, I.K.	6
Gagne, E.	5	Sleeman, D.H.	8	Markle, S.M.	5
Wildman, T.M.	6			Kaufman, R.A.	17
Gustafson, K.L.	9	**6.0**		Morgan, R.M.	8
Knirk, F.G.	6	Bunderson, C.V.	6		
Salomon, G.	7	Hunter, M.	5	**12.0**	
Wittrock, M.C.	6	Joyce, B.	6	Heinich, R.	6
		Christensen, D.L.	5	Bratton, B.	20
2.0		Park, O.	10	Reiser, R.A.	19
Carey, L.	12	Richards, B.F.	5	Silber, K.H.	5
Dick, W.	25	Tulving, E.	6		
Andrews, D.H.	12			**13.0**	
Goodson, L.A.	13	**7.0**		Rogers, E.M.	5
Ericsson, K.A.	5	Foshay, W.R.	6	Branson, R.K.	15
Simon, H.A.	12	Bloom, B.S.	8	Hannum, W.H.	8
Brown, A.L.	11	Masia, B.B.	5	Romiszowski, A.J.	8
Bower, G.H.	10	Grooper, G.L.	7		
Dansereau, D.E.	6	Gilbert, T.F.	5	**14.0**	
O'Neil, H.F. Jr.	8	Merrill, P.F.	9	Barrows, H.S.	6
Weinstein, C.E.	6	Resnick, L.B.	5	Feightner, J.W.	8
				Neufeld, V.R.	5
3.0		**8.0**		Norman, G.R.	16
Frase, L.T.	5	Driscoll, M.	7		
Rieber, L.	15	Snelbecker, G.E.	5	**15.0**	
Mayer, R.E.	5	Higgins, N.	10	Berman, P.	5
Anderson, R.C.	10	Sullivan, H.J.	16	McLaughlin, M.W.	6
Sprio, R.J.	7	Rossett, H.J.	7	Boyer, E.L.	5
Dalton, D.W.	5	Walberg, H.J.	6	Naisbitt, J.	5
Phillips, T.L.	5				
Alessi, S.M.	5				
Trollip, S.R.	6				

TABLE 5.0 (Continued)
Hierarchical Clusters Suggesting Jointly Occupied Positions in the Network of Highly Cited Authors, JID/ETRD (Development Section)

Author	Citations	Author	Citations	Author	Citations
16.0		**17.0**		**18.0**	
Daynes, R.	5	Bandura, A.	5	Bean, T.W.	5
DeBloois, M.L.	6	Mager, R.F.	6	Readence, J.E.	8
Lesgold, A.M.	5	McCombs, B.L.	7		
				*Alesandrini, K.L.	5
19.0		**20.0**		*Becker, H.J.	5
Harmon, P.	6	Barby, R.	9	*Deden-Parker, A.	5
Kearsley, G.P.	17	Kincaid, J.P.	7	*Heyneman, S.	5
Wilson, R.G.	7			*Misanchuk, E.R.	9
21.0					
Alen, V.L.	6				
Kulik, F.G.	6				

* **Isolates**

TABLE 6.0
Hierarchical Clusters Suggesting Jointly Occupied Positions in the Network of Highly Cited Authors, ECTJ/ETRD (Reaearch Section)

Author	Citations	Author	Citations	Author	Citations
1.0		**2.0**		**3.0**	
Campione, J.C.	5	Fleming, M.L.	8	Johnson, C.W.	5
Belmont, J.M.	8	Simonson, M.R.	8	Atkinson, R.C.	10
Butterfield, E.C.	16	Schramm, W.L.	12	Paivio, A.	9
Ghatala, E.S.	5	Winn, W.D.	8	McDaniel, M.A.	5
Cormier, S.M.	9	Eisner, E.W.	7	Bryant, S.L.	5
Gentner, D.	5	Joyce, B.	5	Miller, G.E.	11
Gick, M.L.	5	Schon, D.A.	6	Levin, J.R.	72
Hagman, J.D.	9	Weil, M.	5	Presley, M.	44
Nelson, T.O.	5	Landa, L.N.	8	Reese, H.W.	7
Newell, A.	7	Reiser, R.A.	12	Mastropieri, M.A.	9
Reif, F.	7	Heinich, R.	20	Delaney, H.D.	6
Brown, A.L.	11	Wittrock, M.C.	15	McCormick, C.B.	11
Flavell, J.H.	7	Ball, S.A.	7	McGivern, J.E.	7
Siegler, R.S.	6	Bogatz, G.A.	7	Scruggs, T.E.	9
Stein, B.S.	5	Cook, T.D.	7	Shriberg, L.K.	5
Burton, R.R.	8	Palmer, E.L.	8		
Brown, J.S.	22	Alwitt, L.F.	5	**5.0**	
Sleeman, D.H.	15	Huston, A.C.	8	Pellegrino, J.W.	8
Anderson, J.R.	28	Pezdek, K.	5	Carey, L.	7
Glaser, R.	27	Wartella, E.	9	Dick, W.	10
Greeno, J.G.	12	Anderson, D.R.	28	Andrews, D.H.	5
Simon, H.A.	21	Levin, S.R.	14	Goodson, L.A.	5
Snow, R.E.	28	Lorch, E.P.	14	Resnick, L.B.	8
Salomon, G.	54	Calvert, S.L.	6	Merrill, M.D.	32
Tennyson, R.D.	76	Watkins, B.A.	9	Gagne, R.M.	48
Clark, R.E.	59	Wright, J.C.	13	Reigeluth, C.M.	62
Franks, J.J.	6			Briggs, L.J.	19
Holyoak, K.J.	11	**4.0**		Wager, W.W.	9
Bransford, J.D.	15	Bunderson, C.V.	5	Lockhart, K.A.	5
Peterson, P.L.	10	Slavin, R.E.	12	McCombs, B.L.	17
Steinberg, R.J.	7	Campbell, D.T.	8	Webb, N.M.	11
Thorndike, E.L.	5	Stanley, J.C.	6		
		Seidel, R.J.	7	**6.0**	
7.0		Gay, G.	6	DiVesta, F.J.	6
Mosley, M.L.	7	Steinberg, E.R.	14	Gardner, H.	10
Maehr, M.L.	7	Hannafin, M.J.	48	Anand, P.G.	9
Sulivan, H.J.	19	Morrison, G.R.	21	Jonassen, D.H.	12
Jamison, D.	6	O'Dell, J.K.	12	Petkovich, M.D.	6
Suppes, P.	10	Davidson, G.V.	11	Reder, L.M.	10
Glass, G.V.	6	Rakow, E.A.	16	Romiszowski, A.	8
Cohen, P.A.	10	Ross, S.M.	59	Hartley, J.	14
Kulik, J.A.	33	Carrier, C.A.	21	Allessi, S.M.	6
Bangert, R.L.	13	Williams, M.D.	16	Trollip, S.R.	5
Kulik, C.C.	13			Bork, A.	10
Williams, G.W.	11			Tulis, T.S.	5

TABLE 6.0 (Continued)
Hierarchical Clusters Suggesting Jointly Occupied Positions in the Network of Highly Cited Authors.
ECTJ/ETRD (Research Section)

Author	Citations	Author	Citations	Author	Citations
8.0		**9.0**		**10.0**	
Cronbach, L.J.	9	Waller, R.	5	Bereiter, C.	6
Megarry, J.	5	Bandura, A.	8	Case, R.P.	7
Greene, M.	5	Keller, J.M.	6	Federico, P.A.	6
Pea, R.D.	5	Krisak, N.	5	Montague, W.E.	10
O'Shea, T.	7	McCormick, D.B.	6	Collins, A.M.	15
Bruner, J.S.	9	Kinzie, M.B.	9	Stevens, A.L.	8
Piaget, J.	13	Deci, E.L.	7		
O'Neil, H.F.	8	Lepper, M.R.	14	**13.0**	
Nunan, T.	5	Malone, T.W.	7	Anderson, R.C.	17
Streibel, M.J.	7	Wang, M.C.	9	Bower, G.H.	11
Papert, S.	9			Chi, M.T.H.	6
Taylor, R.	7	**12.0**		Ausubel, D.P.	9
		Craik, F.I.M.	7	Mayer, R.E.	30
11.0		Segal, J.W.	5		
Collins, W.A.	9	Norman, D.A.	13	**14.0**	
Bryant, J.	8	Rumelhart, D.E.	5	Lesgold, A.M.	9
DeBloois, M.L.	7	Spiro, R.J.	7	Lentz, R.	6
Dalton, D.W.	9			Levie, W.H.	12
Garhart, C.	9	**16.0**		Houghton, H.A.	5
Phillips, T.L.	10	Buttrey, T.	5	Willows, D.M.	5
		Park, O.	14		
15.0		Rothen, W.	11		
Dwyer, F.M.	5	Tobias, S.	5	**17.0**	
Grooper, G.L.	5			Liben, L.	5
Christensen, D.L.	10	**18.0**		Bangert-Downs, R.	5
Park, S.I.	7	Gerlach, V.S.	6	Guba, E.G.	15
		Markle, S.M.	5	Lincoln, Y.S.	8
19.0		Schmid, R.F.	5		
Chen, M.	5			**21.0**	
Reeves, B.	5	**20.0**		Bloom, B.S.	9
		Gibson, J.J.	6	Sherman, J.G.	6
22.0		Pettersson, R.	10	Keller, F.S.	8
Branson, R.K.	10			Shulman, L.S.	6
Carroll, J.M.	6	**23.0**			
		Chadwick, C.B.	15	**24.0**	
25.0		Morgan, R.M.	5	Johnson, D.W.	7
Ershov, A.P.	14	Windham, D.M.	6	Johnson, R.T.	6
Kerr, S.T.	9			Sharan, S.	5
*Dunn, T.G.	5	*Guilford, J.P.	5	*Meurrens, M.	8
*Morgan, G.	6	*Morles, A.	6	*Pittman, T.S.	5
*Reiber, L.P.	5	*Roberts, T.	6	*Scanlon, E.	5

* **Isolates**

TABLE 7.0
Hierarchical Clusters Suggesting Jointly Occupied Positions in the Network of Highly Cited Authors.
PIQ

Author	Citations	Author	Citations	Author	Citations
1.0		**2.0**		**3.0**	
Gilbert, T.F.	7	Bloom, B.S.	7	Binder, C.V.	5
Harless, J.	7	Gagne, R.M.	18	Clark, R.E.	5
Smith, M.E.	11	Glaser, R.	14	Ambron, S.	5
Langley, P.C.	6	Merrill, M.D.	5	Hooper, K.	7
Sobel, I.	7	Jonassen, D.H.	16		
Kaufman, R.	43	Reigeluth, C.M.	13	**5.0**	
Wright, P.C.	7			Anderson, J.G.	9
Swanson, R.A.	10	**4.0**		Jay, S.J.	9
Rothwell, W.	16	Landa, L.N.	5	Miller, P.L.	6
Zemke, R.	9	Gerlach, V.S.	15		
		Schmid, R.F.	7	**7.0**	
6.0		Simon, H.A.	12	Kirkpatrick, D.A.	7
Knowles, M.S.	5			Patton, M.Q.	7
Mager, R.F.	5				
* Campbell, D.T.	5	* Hartley, J.	5		

* **Isolates**

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